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Patent Application
NC 82,637

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re : Chow et al
Serial No.: 09/964,544
Filed: Sept. 28,2001
Title: Nanosize Particle Coatings Made By Thermally Spraying Solution Precursor Feedstocks

Examiner: Jason Savage
Group Art Unit: 1775

Date: January 6, 2004

Second Appeal Brief

Commissioner of Patents and Trademarks Washington, D.C. 20231

Sir:

This is an appeal from the final rejection dated Sept. 5, 2003, finally rejecting claims 19, 20, 21, 22, 24 and 25. No claims have been allowed in this application.

(1) Real Party in Interest

The real party in interest herein is the U.S. Navy.

(2) Related Appeals and Interferences

This application is not involved in any related appeal or interference.

(3) Status of Claims

This is a divisional application of co-pending parent application Serial No. 09/106, 456 filed June 30, 1998 and entitled "Nanosize Particle Coatings Made by Thermally Spraying Solution Precursor Feedstocks," now U.S.P. 6,447,848. The claims in the parent case are claims 1-16 directed to a method of forming a film. The claims here on appeal are claims 19, 20, 21, 22, 24 and 25, directed to the thin film or coating.

(4) Status of Amendments

The sole amendment filed after the second final rejection is the amendment dated Sept. 5, 2004, and will be entered for purposes of appeal.

(5) Summary of Invention

By using the process claimed in the parent application which matured into U.S.P. 6,447,848, the coating artisan is given the capability of making thin or thick coatings which are made of nanostructured particles which have a diameter of less than 100 nm (p. 12, line 13 of the specification) and each layer is as thin as about 100 nm (p.12, line 13 of the specification) . Claim 19 recites a thin film or coated material having a nanostructured material with a particle size of less than 100 nm and containing an oxide selected from the group consisting of alumina, zirconia, yttria, and mixtures thereof, which is disclosed on p. 10 in lines 7-10, and elsewhere.

(6) Issues

(i) Whether claims 19 and 20 are anticipated under 35 U.S.C. 102(e) by the Hunt reference (USP 5,997,956).

(ii) Whether claims 21, 22, 24 and 25 are unobvious under 3 5 U. S.C. 103 (a) over the Hunt reference (USP 5,997,956).

(7) Grouping of the Claims

All claims on appeal herein, i.e., claims 19, 20, 21, 22, 24 and 25, do not stand or fall together. Claims 19 and 20 stand finally rejected as being anticipated and claims 21, 22, 24 and 25 stand finally rejected as being obvious. The anticipation and obviousness standards of patentability under 35 U.S.C. 102(a) and 35 U.S.C. 102(a) are different and can lead to different results.

(8) Arguments

(iii) With respect to the rejection of claims 19 and 20 on 35 U.S.C. 102(e) as being anticipated by the Hunt reference, it is believed that claims 19 and 20 are no longer properly rejectable as anticipated by the Hunt reference since these claims specify that the thin film or coated material is made by thermal spraying solution precursors and are devoid of splat microstructures greater than several microns thick whereas the Hunt reference discloses powder formation and thin film deposition by vapor deposition. Furthermore, the Examiner has admitted that the Hunt reference is silent as to the size of the splats or anything connected therewith.

(iv) With respect to the rejection of claims 19, 20, 21, 22, 24 and 25 on 35 U.S.C.103(a) as being obvious over the Hunt reference, since the Hunt reference does not exemplify an embodiment that is both multilayered and graded, the Examiner has concluded the it would have been obvious to form a multilayer nanostructure which was graded since it is specifically suggested as a suitable structure by the reference. It should be noted that claims 19 and 20 define the multilayer this film or coating to a material that is made by thermal spraying of solution precursors and a material that is devoid of splat microstructures greater than several microns thick. It should also be noted that claim 21 depends on claim 20, claim 22 depends on claim 21, claim 24 depends on claim 21 and claim 25 depends on claim 20. As noted at bottom of p. 2 and top of p. 3 of the specification, although thermal spraying is a viable approach to preparing thick coatings, the use of the powder agglomerate feedstock has limitations and problems. First, the sprayable powders often require reprocessing from the parent powders by controlled agglomeration, which adds more cost to the production and often introduces impurities if surface-active precursors are used as binders. Second, the splat boundaries in the as-sprayed

coatings are often the initiation sites for flaw propagation that consequently lead to mechanical failure of the coatings. Third, the as-formed splat microstructures present a limitation on the scale of chemical homogeneity and mixing of multiphasic materials when desired because the splat is at least greater than several microns thick, due to the flattening of the molten particles on impact. Unfortunately, these large splat particles become a serious problem when multifunctional applications require multilayered, hybrid coatings with fine, continuous interferences, since the length scale of an interface is limited by the splat microstructure. Consonant with what is stated above, the Hunt reference discloses powder formation and thin film deposition by vapor deposition and is, therefore, not consonant with an obviousness rejection.

The fee for filing this brief has been already paid on Feb. 26, 2003. Please charge our deposit account #50-0281 for any additional fee due.

Respectfully submitted,

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Jan. 6, 2004
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(9) Appendix

The claims involved in this appeal are the following claims 19, 20, 21, 22, 24 and 25:

19. A thin film or coated material made by thermal spraying and being devoid of splat microstructures greater than several microns thick having a nanostructured material with a particle size of less than 100 nm and containing an oxide selected from the group consisting of alumina, zirconia, yttria, and mixtures thereof.

20. A multilayer thin film or coated material made by thermal spraying and being devoid of splat microstructures greater than several microns thick having a nanostructured material with a particle size of less than 100 nm and containing an oxide selected from the group consisting of alumina, zirconia, yttria, and mixtures thereof.

21. The multilayer thin film or coated material of Claim 20, having a nanostructure graded material and a fine scale grading, both compositionally and microstructurally.

22. The multilayered thin film or coated material of Claim 21, wherein the layers are integrated by graded interfaces rather than abrupt interfaces so as to permit the compatibility of multilayered materials.

24. The multilayered coated material of Claim 21, wherein the grading is microstructural, structural and chemical with continuous interfaces at a fine scale.

2 5. The graded thin film or coated material of Claim 2 0 having a nanostructured graded material and fine scale grading, both compositionally and microstructurally.